



October 12, 2016

Project: Pre-construction assessment for property re-development at 15511 NE 90th Street, Redmond, WA. Parcel number 022505-9224.

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Objectives: Evaluate health of existing trees and establish criteria for the preservation of those to be retained.

Description: The lot has been essentially undisturbed since the initial development in 1980. This is a light industrial site, the only trees present within the lot proper were planted on the borders with a few placed in landscape islands within the parking lots (Figure 1). The Sammamish River lies 120' to the east of the development site and King County Parks owns a 100' wide trial buffer between the two. Close to a third of the trees inventoried stand within the buffer but are 50' or less from the east property line. Another set stands on the north side of the neighboring property to the south.

The existing buildings will be razed and the proposed changes for the property include a main parking area covering the east half of the site and a smaller main building on the west side as shown in Figure 2. The landscape islands within the parking areas will be reworked also.

The following itemized list begins at the existing southwest entrance to the building site. It includes the trees currently on the property and those within 50' of the borders and the numerical designations are reflected in the tree plots shown in Figures 3 and 4, and in the summary inventory given in Figure 5 at the end of the report. The diameters measured were taken at the standard height of 54" above grade (DSH). The trees in the inventory were not tagged. The first section includes all of the trees growing on the subject property but outside the shoreline buffer zone. The second section includes all of the trees on the subject property which stand in the buffer zone. The third section has those trees outside the property and within the shoreline buffer zone. The fourth section is for those trees standing outside the subject property and outside the buffer zone.

Trees standing on the property but outside the buffer

- 1) Red Oak 8.5" DSH, 28' tall, 8' spread north side of SW entrance in the planting strip. Tree is in good condition with normal growth and color for its age category.
- 2) Red Oak 4" DSH, 20' tall, 5' spread 30' north of #1 oak. Tree is in good condition with normal growth and color for its age category.
- 3) Red Oak 10.5" DSH, 32' tall, 14' spread 30' north of #2 oak. Tree is in excellent condition with great growth, color, and structure for its age category.
- 4) Red Oak 10.5" DSH, 32' tall, 14' spread 60' north of #3 oak. Tree is in excellent condition with great growth, color, and structure for its age category.
- 45) Douglas Fir 12.5" DSH, 45' tall in fair condition. The tree has reasonable color and fairly balanced canopy. It stands 6' SW of the SW corner of the west building.
- 46) Douglas Fir 15" DSH, 60' tall in fair condition. It stands 9' SSW of the SW corner next to the #45 tree (see Figure 22).
- 47) Douglas Fir 12" DSH, 35' tall in fair condition. It stands 6' W of the #46 fir.

Trees standing on the property and inside the buffer

- 10) Douglas Fir 15" DSH, 40' tall in good condition. The tree has decent color and fairly balanced canopy. It is standing 15' east and 20' south of the NE corner of the east building.
- 12) A Douglas Fir 14" DSH, 40' tall in good condition. The tree has decent color and fairly balanced canopy. It is 15' east of the building and 10' south of the #11 fir.
- 19) Aspen 10" DSH, 42' tall, 6' spread standing 6' south of center, 12' east of the building. Tree is in weak condition with below average new growth, poor color, and there is slight ground shift when the stem is pushed on by hand. Its base has little flair and there are fungal bodies indicative of black rot (Figure 10). The trunk bends to the west from the 10' mark and the canopy over shadows the building (Figure 11).
- 20) Aspen 12.5" DSH, 45' tall, 8' spread standing 8' SW of the #19 tree, 6' east of the building. Tree is in weak condition with below average new growth, poor color, and there is poor resonance when sounded by hand indicating significant center decay. The tree leans to the west and the canopy over shadows the building.
- 21) Aspen 8.5" DSH, 40' tall, 5' spread standing 6' east and in the same line as the #20 tree. It is in fair condition. The tree has decent color and new growth.
- 22) Aspen 7" DSH, 36' tall, 5' spread standing 3' SE of the #21 tree. It is in fair condition with decent color and new growth. It leans to the southeast.

- 23) Red Maple 14" DSH, 36' tall, 16' spread in poor structural condition. The tree has decent color and new growth. The majority of its canopy extends to the west and hangs over the building as shown in Figure 12. It stands 12' east and 8' north of the SE corner of the building. There is a 5" caliper atrophied spar at the 9' mark on the east face (Figure 13). The tree leans increasingly to the west as it grows.
- 40) Listed here because tree stands on corner where the subject property, the 8950 154th Avenue property, and the King County greenbelt meet. Fully described in the third section. The center stem is probably on the line or just south of it, the small stem is most likely on the subject property, and the third stem fully on the 8950 property. The tree is not significant as it has serious structural faults and will be considered as being in poor health.
- 42) Douglas Fir with 15.5" DSH, 60' tall in fair condition. Majority of the canopy is above the half way mark. The color is decent and there is good new growth most of which extends to the west. It is subordinated to the #40 cottonwood and stands even with the #41 maple. Some of the larger tree's limbs cross through the fir's canopy and one rubs against the stem as shown in Figure 20.
- 43) Aspen 7" DSH, 28' tall, 6' spread in poor condition. The tree has reasonable color and below average new growth. It stands 12' south of the SE corner of the east building. It has weak structure in the upper canopy.
- 44) Aspen 8.5" DSH, 30' tall, 8' spread in poor condition. The tree has reasonable color and below average new growth. It stands 6' south of the SE corner of the east building. It has a structural fault near the 20' mark where the trunk turns 90 degrees to the north and extends over the corner of the building (Figure 21).

Trees standing outside the property and in the buffer

- 6) Sequoia (Glauca) 27" DSH, 45' tall standing 30' east and 12' north of the NE corner of the east building. It is in great condition with excellent color and growth habit.
- 7) Sequoia 25" DSH, 45' tall standing 16' SE of #6 tree. It is in great condition with excellent color and growth habit.
- 8) Sequoia (Glauca) 25" DSH, 45' tall standing 16' SE of #7 tree. It is in great condition with excellent color and growth habit.
- 9) Sequoia 27" DSH, 42' tall standing 25' SSE of #8 tree and 6' west of the end of the bridge buttress wall. It is in great condition with excellent color and growth habit.
- 10) (Listed in second section)

- 11) Douglas Fir tree 8.5" DSH, 40' tall standing 6' east and 12' south of the #10 fir. It is in fair condition with decent color and good new growth but a mostly one sided canopy to the east.
- 12) (Listed in second section)
- 13) Dead birch stub 8" DSH, 12' tall 10' SE of #12.
- 14) A stand of five Cascara trees standing at the end of the bridge buttress between it and the walking path. The stems are all less than 6" DSH and no more than 35' tall. It is in good condition with average new growth and color. Trees are not the native varietal.
- 15) A Douglas Fir tree with 15" DSH, 42' tall in fair condition. The tree has reasonable color and fairly balanced canopy. It stands 20' east of the building near the center line.
- 16) Big Leaf Maple tree 13" DSH, 38' tall, 16' spread in good condition. The tree has average color, fairly balanced canopy, and average new growth. It stands roughly 35' ESE of the #15 fir.
- 17) Cottonwood 34" DSH, 85' tall, 22' spread in poor condition. The tree has reasonable color and unbalanced canopy. It has average new growth but lower density, large caliper die back, and large caliper breakage (Figure 8). There is a cavity with decay on the south side of the base which was probed to 18" (Figure 9). There are multiple decay points in the scaffolds. The tree is 25' east of the center of the building.
- 18) Douglas Fir tree with 11.5" DSH, 40' tall in fair condition. The tree has decent color and average new growth. It stands 15' SE of the #17 cottonwood. It leans to the NE returning to vertical at the 14' mark.
- 19) (Listed in second section)
- 20) (Listed in second section)
- 21) (Listed in second section)
- 22) (Listed in second section)
- 23) (Listed in second section)
- 24) A hemlock tree with a 6" DSH, 18' tall in fair condition. The tree stands 25' due east of the #23 maple.
- 25) A Douglas Fir 8" DSH, 8' tall in fair condition. It is standing 6' east and in the same line as the #24 tree.
- 26) Douglas Fir 10" DSH, 22' tall in fair condition, 12' ESE of the #25 tree.

- 27) Cottonwood tree 18" DSH, 55' tall, 16' spread in poor structural condition. The tree stands 15' due south of the #26 fir and its base is 25' west of the trail. Majority of its canopy extends to the east and its mainstem bends to the east as the tree rises. The color is good and there is average new growth.
- 28) Cottonwood tree 29" DSH, 85' tall, 30' spread in fair condition. Majority of the canopy extends to the east and hangs over the #27 tree. The color is good and there is average new growth. It stands 8' due west of the #27 cottonwood.
- 29) Cottonwood tree 31" DSH, 95' tall, 22' spread standing 6' due west of the #28 tree. It is in fair condition with average new growth and color. A 14" caliper leader broke out of the north side canopy.
- 30) Cottonwood tree 16" DSH, 48' tall, 12' spread all to the west side. It is in poor condition with an open wound at the NE quadrant of the base which shows advanced decay (Figure 14). Its entire canopy extends to the west. The tree stands 20' due east of the SE corner of the building.
- 31) Douglas fir tree with a 5" DSH, 18' tall in good condition standing 8' SE of #30 tree.
- 32) Douglas Fir 5" DSH, 18' tall in good condition standing 10' SE of #31 tree.
- 33) Douglas Fir 5.5" DSH, 18' tall in good condition standing 7' SW of #32 tree.
- 34) Douglas Fir 5.5" DSH, 20' tall in fair condition standing 10' ESE of #33 tree.
- 35) Douglas Fir 5.5" DSH, 20' tall in good condition standing 8' NE of #34 tree.
- 36) A hemlock tree with a 4.5" DSH, 16' tall in fair condition. The tree stands 12' due east of the #35 fir.
- 37) Douglas Fir 10" DSH, 35' tall in fair condition standing 10' WSW of #36 tree. Canopy is all in the SE quadrant.
- 38) Dead birch 12" DSH, 54' tall, leans to the NW, and stands 10' south of the #33 cottonwood.
- 39) Cottonwood tree 27" DSH, 90' tall, 22' spread mostly to the south side. There is a significant decay point at the 40' mark on the north face of the mainstem (Figure 15). Majority of the canopy extends to the SW and hangs over the handicap parking at the east end of the drive. The color is fair and there is average new growth. It stands 18' SSE of the #33 fir.

- 40) Three stem cottonwood located at the east end of the entrance drive 15' east of the curb line and 30' south of the SE corner of the building. South stem is 24" DSH, 45' tall, 30' spread to the SW over the handicap parking. It has compromised attachment to the center stem (Figure 16) which is 27" DSH, 95' tall, 30' spread all to the west. The north stem is 14" DSH, 45' tall, 18' spread and it leans to the NW nearly crossing over the SE corner of the existing building. There is surface evidence of a beam fracture east to west in the center stem (Figures 17 and 18). There are large caliper breaks throughout the canopy. The tree's roots are beginning to lift the asphalt in multiple places. Because of the number and severity of the structural faults this tree will be classified as being in poor health according to the City of Redmond's definitions.
- 41) Red Maple 11.5" DSH, 28' tall, 14' spread standing slightly west and under the #40 cottonwood. Its canopy grows all to the west over the drive (Figure 19). It is in fair condition.
- 42) (Listed in second section)
- 43) (Listed in second section)
- 44) (Listed in second section)
- 45) (Listed in first section)
- 46) (Listed in first section)
- 47) (Listed in first section)
- 48) Sweetgum tree with a 13.5" DSH, 50' tall, 14' spread in poor structural condition. It stands 10' north and 5' west of the NE corner of the building south of the subject property. Its color is decent and there is good new growth but it has a large caliper breakout point mid canopy on the north side (Figure 23).
- 49) Sweetgum 18" DSH, 60' tall, 18' spread in fair condition standing 4' north, 12' west of the NE corner of the southern building. The tree has reasonable color and fairly balanced canopy. It is standing right next to a set of utility vaults which are lifting somewhat.

Trees located within 50' of the property but outside the shoreline buffer

- 5) Red Maple 11" DSH, 32' tall, 18' spread standing 45' east of the NW corner of the property. Tree is in weak condition with surface cracking at its base indicative of cankers (Figure 6). Center stems are dying and dead (Figure 7).
- 50) Moraine locust 11.5" DSH, 38' tall, 12' spread standing 15' west of the #49 tree. It is in fair condition.
- 51) Recently missing Moraine locust

- 52) Moraine locust 11" DSH, 25' tall, 8' spread standing 35' west of the #50 tree. It is in weak condition. Nearly 70% of the tree's canopy broke out during a storm event. The remaining section leans over the parking area.
- 53) Moraine locust 13.5" DSH, 40' tall, 14' spread standing 20' west of the #52 locust. It is in fair condition. There is evidence of root uplift in the parking area.
- 54) Moraine locust missing at least two years.
- 55) Moraine locust 8.5" DSH, 40' tall, 10' spread standing 40' west of the #53 tree. It is in fair condition but leans over the parking. A large section of the tree's canopy broke out recently.
- 56) Moraine locust 8" DSH, 40' tall, 16' spread standing 20' west of the #55 tree. It is in fair condition. It has a low hanging large caliper branch which extends over the parking area as shown in Figure 24.
- 57) Moraine locust 9.5" DSH, 40' tall, 16' spread standing 15' west of the #56 locust. It is in fair condition. It has a low hanging large caliper branch which extends over the parking area.
- 58) Moraine locust 9.5" DSH, 40' tall, 9' spread standing 15' west of the #57 locust. It is in fair condition.
- 59) Moraine locust 8" DSH, 16' tall, 15' spread all to the north and low over the drive. It is standing 8' north of the #58 tree and is in fair condition.
- 60) Moraine locust 10.5" DSH, 40' tall, 18' spread all to the NW over the drive as shown in Figure 25. It is standing 8' west of the #59 tree and is in fair condition.
- 61) Scotch pine 13.5" DSH, 45' tall standing 15' west of the #58 locust. It is in fair condition.
- 62) Scotch pine 9" DSH, 40' tall standing 5' SW of the #61 pine. It is in fair condition.
- 63) Sweetgum 10.5" DSH, 40' tall, 14' spread all to the NW and over the drive. It is standing 8' west of the #61 pine and is in fair condition.

There are numerous other trees growing along the trail and river on the eastern perimeter of the property. These were not included in this study as they stand more than 50' outside the construction zone and will not be impacted by the redevelopment.

Methods: Tree assessment is both an art and a science. To properly perform, an arborist must have an extensive background in biology, tree mechanics, and tree structure that is equal parts academic and field knowledge. It takes years of study to recognize and correctly diagnose the subtle signs trees exhibit before their failure, whether it be partial or total. The process begins with a visual inspection (visual tree assessment, VTA) which is followed up as necessary with soundings, core testing, and/or other detection means. Each tree is examined and evaluated according to several factors including species type, size, vigor, injuries present, root and grade disturbance, deadwood, location and extent of decay, stem taper, exposure, and targets that are at risk.

For the purpose of this report the following definitions are used as defined by the City of Redmond Planning Department. A *significant tree* is one that is 6" in diameter or greater and healthy. *Healthy* refers to assessed conditions including fair, good, great, or excellent. Unhealthy trees, those which are in weak or poor condition, will not be considered in the data tables although they will be shown and reviewed within the inventory, risk assessment, discussion, and recommendation sections.

The International Society of Arboriculture (ISA) has recently published a Best Management Practices bulletin to aid in their tree risk assessment program. This methodology for risk matter assessment will take the place of the standard ISA model currently in use. While focusing on a qualitative analysis the program is still based on three aspects of tree risk; failure potential, size of part failing (potential of damage from impact), and target rating. The aspects are scaled as follows. Failure potential (FP) can be imminent, probable, possible, or improbable. Target rating (T) is based on frequency of occupancy and is listed as very low, low, medium, or high. Selections are made in each of the first two categories and a likelihood of target impact found. It can be rated as unlikely, somewhat likely, likely, or very likely (see Figure 26). Obviously a level of null risk does not exist if a tree is present. For practical purposes however, arborists assume that if there is no target, the tree poses little or no risk.

The consequences of the failure, usually a function of the size of the failed part, are listed as negligible, minor, significant, or severe. Combining the likelihood of a tree failure event with the consequences of that event allows a trained arborist to assign a level of risk to a given tree's situation. There are four acceptable categories within the model; Low, Moderate, High, or Extreme. The highest level, extreme, can only be assigned when the likelihood of failure and impact is high (very likely) and the consequences are severe (see Figure 27).

Risk Assessments: There are three potential failure types present in the trees profiled; branch, stem, and catastrophic. Trees which could have main stem failures will inherently include branch failures. The same relation exists for catastrophic and partial stem failures.

Cottonwood trees are notorious for being weak in structure. They are one of a handful of species that are known to be susceptible to the sudden limb drop phenomenon, a condition where a tree will shed a large limb on a calm day for no apparent reason. They also appear consistently in the tree failure data base with failed crotches, broken limbs, sheared spars, and uprooting. The more rapid the growth of these trees the more prone they become to these types of failure. The black cottonwood can reach its mature height of up to 200' in sixty to seventy years.

The trees which have characteristics of branch failure include the #27-29 cottonwood, the #48, #49, and #63 sweetgums, and the #52, #55-57, and #60 Moraine locusts. All of these trees have probable **likelihoods of branch failure**. Branches from the cottonwoods have a **low likelihood** of hitting someone using the walking trail. This makes these trees **unlikely** to fail and impact. Even though the consequences of limb drop for the cottonwood would be **severe** if it struck someone, as it is unlikely to occur they are overall **low risk** trees. Branches from the sweetgums and locusts on the other hand hang over the parking which is used consistently for long periods of time so they are placed in the **high likelihood** category. The consequences of limb drop for the sweetgums and locusts would be **minor** making them **moderate risk** trees.

The trees with a propensity for stem failure include the #23 maple, the #39 and #40 cottonwoods, and the #43 and #44 aspens. Each has a **probable likelihood of failure** because of significant structural weaknesses in their formation. While the maple and aspens have **high likelihoods** of hitting the existing building they would only have **medium likelihoods** of striking a car or pedestrian in the proposed parking area. So they are **likely to fail and impact** now but only **somewhat likely to fail and impact** in the redeveloped scenario. The consequences could be **significant** in either case making each tree a **high current risk** but only a **moderate risk in the future**.

The #39 and #40 cottonwoods over shadow the handicap parking for the property to the south and the shared driveway and have **high likelihoods** of hitting either. This makes them **likely to fail and impact** now and in the future. The consequences could be **severe** resulting in each tree having a **high risk** category.

The #17 and #30 cottonwoods along with the #19 and #20 aspens are significantly compromised due to the extent of basal decay present and have **probable likelihoods of catastrophic failure**. Each has a **high likelihood** of hitting the existing building. The cottonwoods are tall enough to strike cars in the proposed parking area and the aspens will reach the driveway portion and center trail shown in Figure 2. This categorizes them as **likely** to fail and impact now or after redevelopment. The results of any of these trees striking the current building or vehicles and pedestrians in the future would be **severe** for the cottonwoods and **significant** for the aspen making each a **high risk** tree.

Discussion: There are two levels of impact at this site, primary and secondary. The primary area includes the environs immediately within the boundaries of the proposed new construction, including the driveway, and the regions within ten feet of those boundaries. In this case as many of the current trees are to be retained as possible.

The secondary impact areas include those regions where the demolition and excavation for the new foundation and other hardscaping will cross into the Critical Root Zone (CRZ) of the surrounding trees. This region is defined as a radial distance equal to one foot per inch of tree diameter. A Certified Arborist will have to be onsite to evaluate the degree of impact and help design a mitigation scenario according to onsite realities. As the work begins to expose roots, systematic hand root pruning, rather than tearing and shearing by machine, should be done.

All the trees which are to be retained will have to be protected by laying down layers of mulch to cushion the impact of the heavy equipment directly on their roots and to prevent soil compaction. A rough rule of thumb would be 8-12" of mulch laid down out to 3' past the existing driplines as possible. Typically fencing is installed to designate no impact zones and is usually placed at the distance proscribed by the City of Redmond for non-incursion which is one linear foot per linear inch of diameter. Orange vinyl barrier fencing can be used, although chain link is preferred.

Trees standing on the property but outside the buffer

On the west side the #1-#4 oaks are within the primary impact region shown in Figure 2 which will be reformatted for the new building entrance. Ultimately the new hardscaping will create more root space for these four trees. They should be able to be retained as long as the demolition work is done carefully. A great deal of the asphalt and curbing removal will have to be done by hand. It will be beneficial for these trees to have deep root feeds post construction to both break up the existing compaction and to aid in impact stress recovery.

The firs #45-47 at the SW corner are within the primary impact footprint and will be removed as the building will be constructed where they are standing.

Trees standing on the property and inside the buffer

The #43 and #44 aspens stand in the primary impact zone at the SE corner. They are in poor condition, do not count as viable trees, and will be removed.

The #42 fir has a 15.5" DSH and hence a 15' 6" radial root protection zone. The corner of the existing sidewalk is about 6' from the base of this fir and the two sides travel west and north away from it. The tree is proposed to be retained even with the impact. It will be discussed further later in this section.

There are six trees onsite within the secondary impact zone. The #10 and #12 firs; the #19 and #20 aspens; the #23 maple; and the #40 cottonwood are all along the edge of the demolition area. The #19 and #20 aspens are in poor condition, were condemned in the Risk Assessment section, and will be removed. Likewise the #23 maple as it is in poor condition and has unnecessary risk components.

The #22 aspen's root system extends 7' out from the tree and it stands 9' out from the impact zone so it will not be impacted by the redevelopment process.

The #40 cottonwood stands in the SE corner of the property and may be shared by the 8950 154th Avenue property to the south and/or the King County buffer land. This tree was listed as being in weak condition and therefore is a non-significant tree according to the City of Redmond code. It was assessed as being a high risk to persons and property and should be removed. At minimum the 14" north side stem will be removed and the canopy on the center stem will have to be pruned back from the parking area and drive for the Hopelink site.

This leaves just two viable trees on the property and in the buffer which have root systems extending within the construction area. The #10 fir stands 10' back from excavation zone as does the #12 tree. They have 15" and 14" diameters respectively indicating 15' and 14' CRZs.

Trenching type incursion, that is excavation that will occur along only one sector of a tree's CRZ, can reach significantly into the root growth area without having a detrimental long term effect. What does have to be absolutely protected is a tree's Structural Root Plate (SRP). This radial area is again related to the diameter inches of the tree in question but not quite in a direct proportion as in the CRZ. Figure 29 below illustrates the relationship.

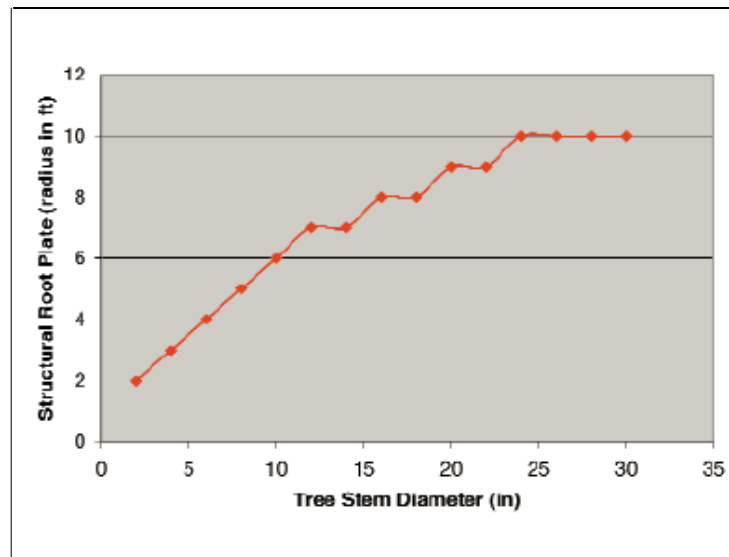


Figure 29. Size of the Structural Root Plate in relation to tree stem diameter. Note that the SRP levels off at 10' for any tree over 24" in diameter.

In the case of the #10 fir mentioned above, the demolition of the old building will come as near as 10' to the base of the tree. From Figure 29 the Structural Root Plate for a 15" DSH tree is given as 7' so the excavator should not interfere with its SRP. The #12 fir also has a 7' SRP and should be OK.

The #42 fir is a more difficult case as the demolition will come to within 6' of the base of the tree but only at an acute angle. The limit of incursion is the same as for the #10 tree, 7' so the onsite arborist will have to make sure that there is no occurrence of root damage inside that limit.

The chart shown in Figure 30 below is used to determine what percentage of a tree's Critical Root Zone will be affected by trenching type incursion. In general trees can sustain losses of up to 30% of the overall area within their CRZ without having long term detrimental results.

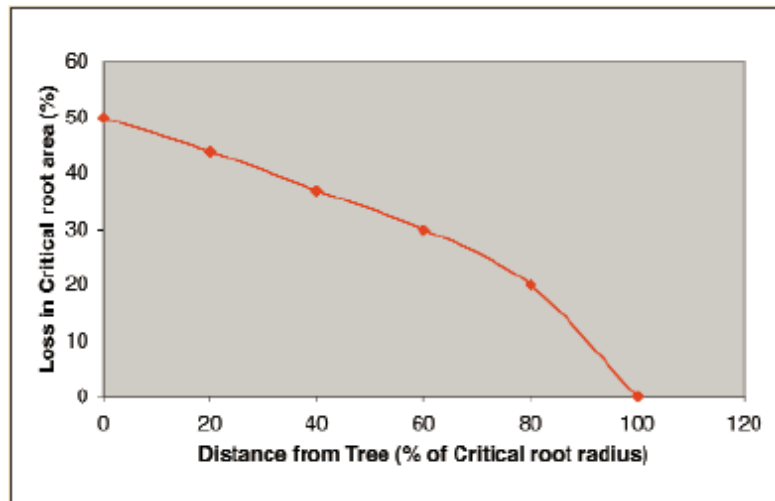


Figure 30. Chart giving the loss in critical root area as a function of the radial distance to the CRZ disturbance.

Using the #10 fir again as the example, with the demolition excavation being 10' from the tree's base and it having a 15" DSH, there will be impact at a linear distance equal to 66% of the fir's CRZ. The chart shows that this equates to about 27% loss in Critical Root Area (CRA) and the fir should be fine long term. The CRA loss for the #12 fir (10'/14" DSH) would be roughly 25% and it would be expected to survive the impact with no long term detrimental effects.

Again, determining the impact on the #42 tree is not a simple matter. The sidewalk removal crosses partway through an arc of the circumference of the fir's CRZ. It intersects at a tangent and exits perpendicular to the main stem but not in line with it. Using principals of geometry the wedge of lost area can be closely determined to cover 134.6 square feet. The total Critical Root Area according to the DSH is 754.4 square feet. This means, by calculation, the tree will be impacted at 17.8% of its CRA. If the sidewalk is just removed, and lifted out carefully, the tree actually should gain rooting space. If one is to be re-installed in the same area the calculated CRA loss is well within the acceptable limits.

Trees standing outside the property and in the buffer

There are seven trees standing outside the subject property with root systems which may be close enough as to be affected by construction impact. Of these only two (#15 and #41) are classified as significant by the City of Redmond. The other four (#5, #13, #17, and #30) are in poor condition and will not be addressed.

The #15 fir tree has a 15" DSH and was measured to be 20' from the edge of the proposed demolition excavation. It should not be impacted and will be fine. The #41 Red maple stands in the same landscape island as the #42 fir but is roughly 4' south of the property line. It has a 11.5" DSH and should not be affected by the construction which appears to come no closer than 14'.

Trees located within 50' of the property but outside the shoreline buffer

Even though the #5 Red maple is in weak condition it will become the only City tree near the proposed new building. Therefore it merits some discussion in regards to the impact it will or will not sustain from the redevelopment process. With an 11 inch DSH, the maple has an 11 foot radial CRZ. The north side of the proposed building will be less than 10' from the southern edge of this tree's root radius according to the plans shown in Figure 2. Assuming that in the worst case the excavation for the new north side foundation will come as near as 9' to the base of the tree, and knowing that from Figure 29 the Structural Root Plate for an 11" DSH tree is given as 6.5', it can be expected that building the new foundation should not interfere with its SRP.

Looking at the Critical Root Area consequence, with the foundation excavation being 9' from the tree's base, and it having an 11" DSH, there will be impact at a linear distance equal to 82% of the maples CRZ. The chart shows that this equates to less than a 10% loss in CRA and so the construction should have little negative influence on the maple long term.

Of special note, the canopies of the #59 and #60 Moraine locusts along with the # 63 sweetgum are hanging low enough and extend far enough into the drive that construction equipment may strike them.

Recommendations: While preserving green spaces and the resulting biological diversity is important, trees that pose threats to persons or property must be managed so that safety is the highest priority. Because of their high risk ratings it is strongly recommended that the #17, #30, #39, and #40 cottonwoods be removed during the demolition period of the project.

Trees standing on the property but outside the buffer

The #45-47 firs at SW corner of the existing west building will be removed as they are within the bounds of the new building.

Preserving the #1-4 oaks will take great care and high attention to minimizing construction impact. Each will have to have a Certified Arborist standing by it as the demolition is done and the excavation completed for the new foundation, sidewalks, and parking areas. Much of the work next to these trees will have to be completed by hand to preserve the maximum amount of their Critical Root Areas. If root intrusion becomes too great in the reality of the construction process some, or all, of these trees may have to be removed.

Trees standing on the property but inside the buffer

The #19, #20, #43, and #44 aspens and the #23 maple will be removed because of their poor conditions which contributed to their risk ratings and non-significant status.

The #42 Douglas fir, much like the oaks on the west side, will require careful attention to detail in the sidewalk removal process. An arborist should oversee the demolition and work closely with the crews to limit impact. If it is done correctly the tree can be safely retained.

The #40 cottonwood should ultimately be removed because its poor condition led to an unacceptable risk rating. If for some reason this cannot be accomplished the smaller stem must be removed and the overweight scaffolds pruned back significantly.

Trees standing outside the property and in the buffer

While the construction process will not impact any of these trees the aforementioned high risk trio (#17, #30, and #39) must be removed for public safety. Their extremely poor conditions cannot be mitigated by anything less than converting them to habitat snags.

The trees near the proposed Sammamish Trail access path should be monitored during any trail improvements but root intrusion should be minimal.

Trees located within 50' of the property but outside the shoreline buffer

The situation with the #5 maple will have to be monitored carefully as to limit impact to the least amount possible.

It would be advisable to have many of the trees pruned before beginning the project in order to mitigate risk issues and damage issues from canopies hanging low of the drive.

The retained trees on the site should be mulched and inspected post construction to evaluate the degree of impact the changes in the hardscape will have on their health. Changes in water runoff patterns and lesser amounts of bio-available detritus will affect their physiology to some degree. Deep root feeding to aid in dealing with the construction shock is recommended.

The tables shown in Figures 31 and 32 at the end of this report summarize the construction impact to the project's trees. Of the significant trees on the subject property, 73% will be retained and 27% will be removed for construction impact. These ratios could change if realities on the ground create removal scenarios for proposed retained trees.

Waiver of Liability Because the science of tree risk assessment is constantly broadening its understanding, it cannot be said to be an exact science. Every tree is different and performing tree risk assessment is a continual learning process. Many variables beyond the control, or immediate knowledge, of the arborist involved may adversely affect a tree and cause its premature failure. Internal cracks and faults, undetectable root rot, unexposed construction damage, interior decay, and even nutrient deficiencies can be debilitating factors. Changes in circumstance and condition can also lead to a tree's rapid deterioration and resulting instability. All trees have a risk of failure. As they increase in stature and mass their risk of breakdown also increases, eventual failure is inevitable.

While every effort has been taken to provide the most thorough and accurate snapshot of the trees' health, it is just that, a snapshot, a frozen moment in time. These findings do not guarantee future safety nor are they predictions of imminent events. It is the responsibility of the property owner to adequately care for the tree(s) in question by utilizing the proper professionals and to schedule future assessments in a timely fashion.

This report and all attachments, enclosures, and references, are confidential and are for the use of Poppi Handy, Third Place Design, and their representatives only. They may not be reproduced, used in any way, or disseminated in any form without the prior consent of the client concerned.

Anthony Moran, BS
Certified Arborist
Qualified Tree Risk Assessor
ISA #PN-5847A



Figure 1. Aerial view of the existing lot and building circa 2013. Note the concentration of trees along the east (right) side of the property. The region between the development site and the Sammamish River (right side of the image) is owned by King County Parks. It is part of the Sammamish River Trail system which stretches from Marymoor Park at the south end to Wilmot Gateway Park to the north.

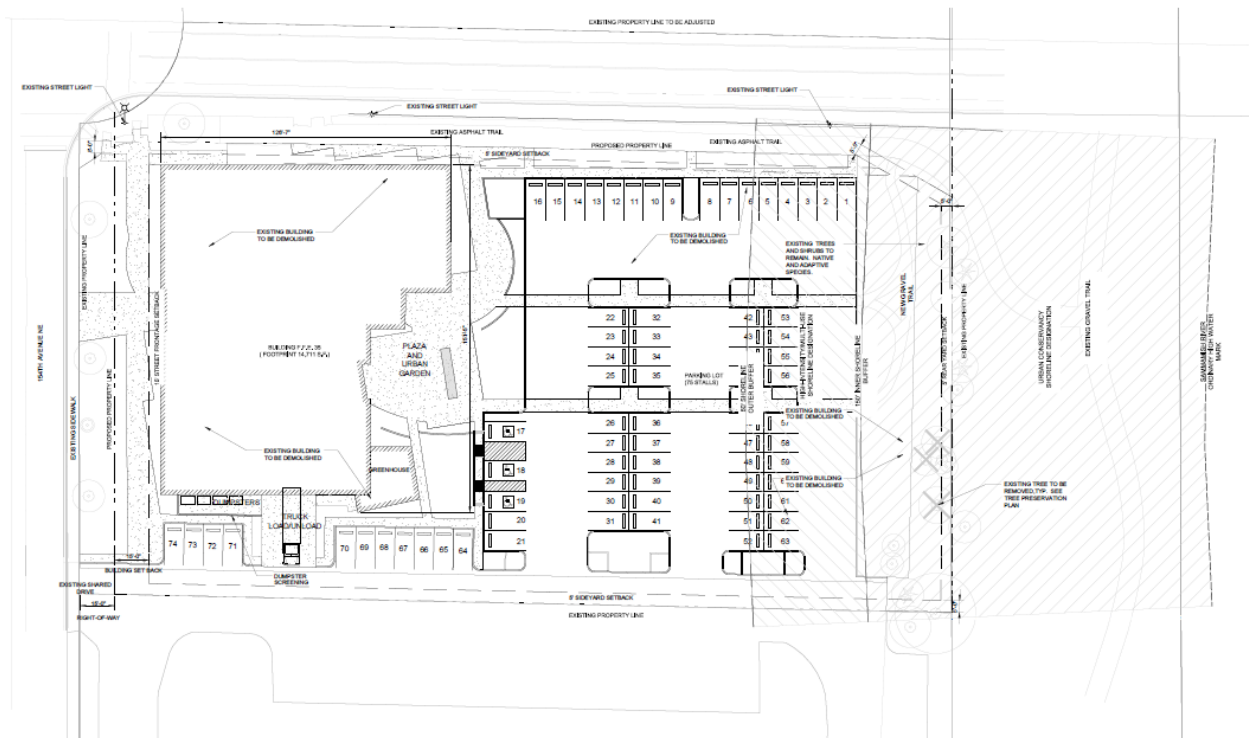


Figure 2. Concept of site redevelopment. Compare to existing above.

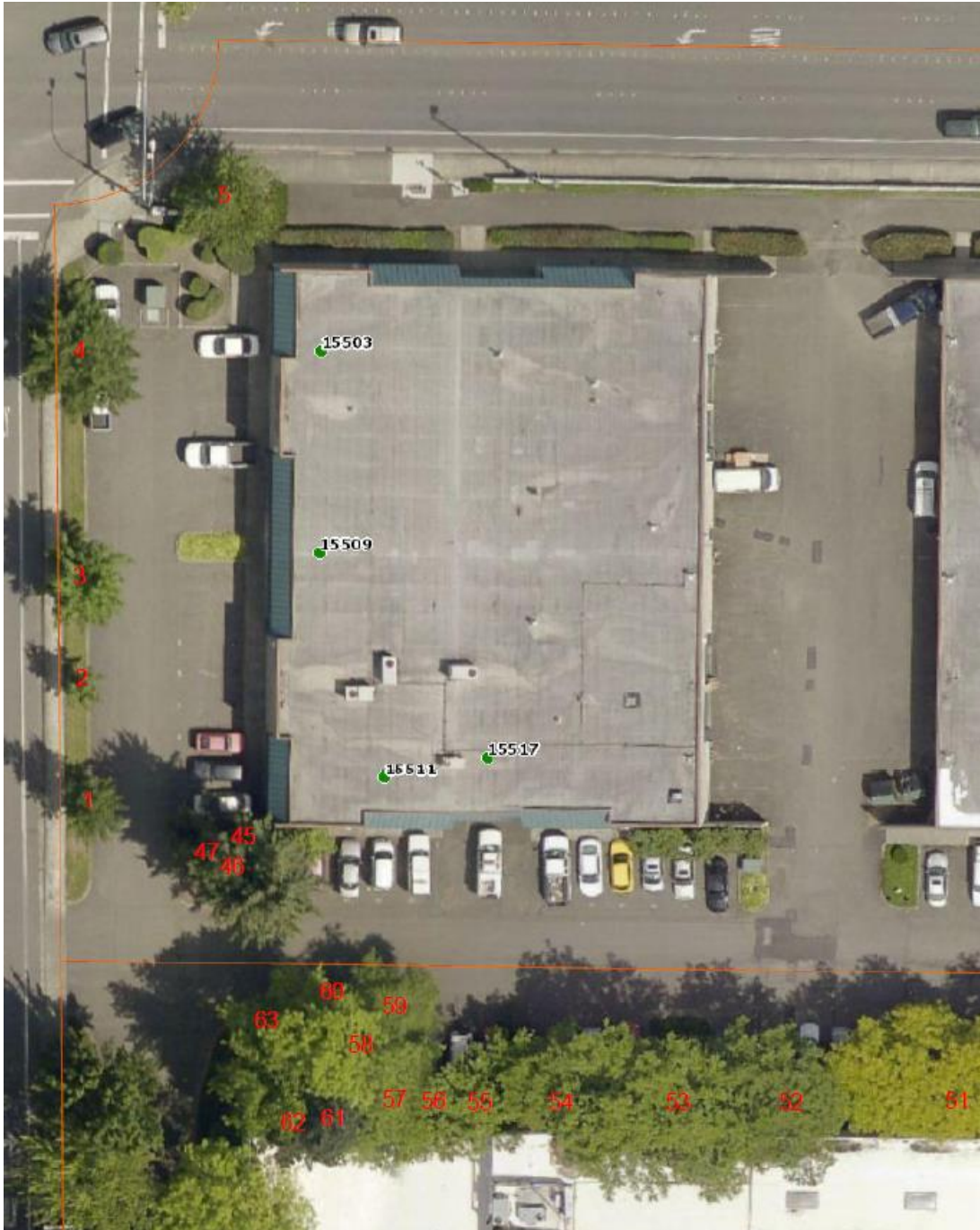


Figure 3. Close up of aerial view showing west side of property. The red numerals correspond to the nomenclature in the description section and show rough placement of the indicated trees. Numbers 51 and 54 were not present at the time of the inventory.



Figure 4. Close up of aerial view showing west side of property. The red numerals correspond to the nomenclature in the description section and show rough placement of the indicated trees. The trees shown which are standing to the right side of the faint red line are within the King County Parks buffer.

Hopelink Inventory

Number	Species	DSH	Height	Condition	Remove	Retain
1	Red oak	8.5	28	good		x
2	Red oak	4	20	fair		x
3	Red oak	10.5	32	excellent		x
4	Red oak	13.5	32	excellent		x
5	Red maple	11	32	weak		x
6	Sequoia, Blue	27	45	excellent		x
7	Sequoia	25	45	excellent		x
8	Sequoia, Blue	25	45	excellent		x
9	Sequoia	27	42	excellent		x
10	Doug fir	15	40	good		x
11	Doug fir	8.5	40	fair		x
12	Doug fir	14	40	good		x
13	Dead birch	18	12	N/A		x
14	Cascara grove	6	35	good		x
15	Doug fir	15	42	good		x
16	Maple, BL	13	38	good		x
17	Cottonwood	34	85	poor	x	
18	Doug fir	11.5	40	fair		x
19	Aspen	10	42	poor	x	
20	Aspen	12.5	45	poor	x	
21	Aspen	8.5	40	fair		x
22	Aspen	7	36	fair		x
23	Red maple	14	36	weak	x	
24	Hemlock	6	18	fair		x
25	Doug fir	8	20	fair		x
26	Doug fir	10	22	good		x
27	Cottonwood	18	55	weak		x
28	Cottonwood	29	85	weak		x
29	Cottonwood	31	95	fair		x
30	Cottonwood	16	48	poor	x	
31	Doug fir	5	18	good		x
32	Doug fir	5	18	good		x
33	Doug fir	5.5	18	good		x
34	Doug fir	5.5	20	fair		x
35	Doug fir	22.5	75	good		x
36	Hemlock	4.5	16	fair		x

Figure 5. First part of inventory table

Hopelink Inventory

Number	Species	DSH	Height	Condition	Remove	Retain
37	Doug fir	10	35	Fair		x
38	Dead birch	12	24	N/A		x
39	Cottonwood	27	90	Poor	x	
40	Cottonwood	24,27,14	95	Weak	x	
41	Red maple	11.5	28	Fair		x*
42	Doug fir	15.5	60	Fair		x*
43	Aspen	7	28	Poor	x	
44	Aspen	8.5	30	Poor	x	
45	Doug fir	12.5	45	Fair	x	
46	Doug fir	15	60	Fair	x	
47	Doug fir	12	30	Fair	x	
48	Sweetgum	13.5	50	Poor		x
49	Sweetgum	18	60	Fair		x
50	Locust, M	11.5	38	Fair		x
51	Missing	N/A		N/A		
52	Locust, M	11	25	Weak		x
53	Locust, M	13.5	40	Fair		x
54	Missing	N/A		N/A		
55	Locust, M	8.5	40	fair		x
56	Locust, M	8	40	fair		x
57	Locust, M	9.5	40	fair		x
58	Locust, M	9.5	40	fair		x
59	Locust, M	8	16	weak		x
60	Locust, M	10.5	40	fair		x
61	Pine, Scotch	13.5	45	good		x
62	Pine, Scotch	9	40	fair		x
63	Sweetgum	10.5	40	fair		x

*May have to be removed depending on extent of impact.

Figure 5. Second part of inventory table.



Figure 6. Photo showing dead and dying center of #5 Red maple.



Figure 7. Photo showing cracks at base of #5 Red maple.



Figure 8. Photo of recent large caliper breakage from the #17 cottonwood.



Figure 9. Cavity at base of the #17 cottonwood.



Figure 10. Base of the #19 aspen showing fungal bodies and little to no flair.



Figure 11. Photo of #19 aspen looking to the south. Note bend to the west.



Figure 12. Photo of #23 Red maple looking to the south and showing the pronounced western canopy growth and the stem lean.



Figure 13. Photo of the #23 maple looking up and to the west. The image shows the atrophied stub (red arrow) which creates a significant weak point.



Figure 14. Photo of base of #30 cottonwood looking to the SW. The decay present behind the wound extends at least 8" deep.



Figure 15. Photo of the #39 cottonwood looking up and to the SE. The large caliper decay point is indicated by the red arrow. The #38 dead birch is shown slightly to left of center.



Figure 16. Photo of base of #40 cottonwood looking to the west. The line down the center of the image (red arrows) shows the active fracture plane between the south and center stems.



Figure 17. Photo of base of center stem of #40 cottonwood looking to the west. The line pointed out with the red arrows is highly indicative of a beam fracture as it is matched on the opposite side as shown in Figure 18 below.



Figure 18. Photo of base of center stem of the #40 cottonwood looking to the east. The red arrow show the seam which is opposite of the one shown in Figure 17.



Figure 19. Photo of #41 Red maple looking to the north and showing its western reaching canopy. The lower stems of #40 tree are shown at the right of the image. The #42 fir stand just behind the maple and the bases of the #43 and #44 aspens can be seen just in front of the building (red arrows).



Figure 20. Photo of #42 fir looking up and to the SW. Note large limb from the #40 cottonwood crossing against its stem (red arrow).

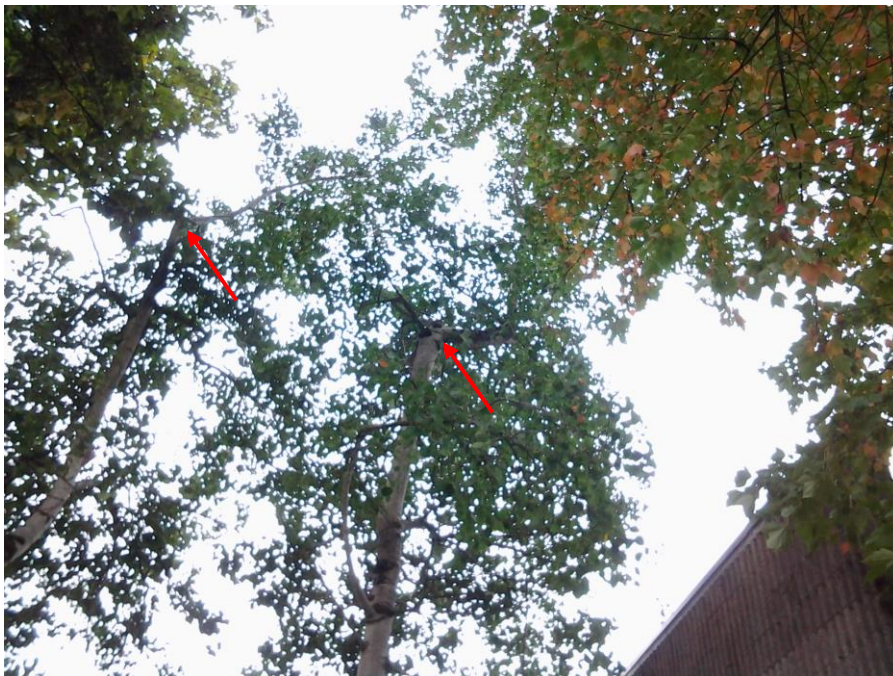


Figure 21. Photo of the #43 and #44 aspens looking up and to the west. Note the significant structural faults (red arrows) present in the upper canopies of both trees.



Figure 22. Photo showing the proximity of the #45, #46, and #47 firs to the existing building and their orientation to each other (labeled in red). These three will be removed as they are within the new construction bounds.



Figure 23. Photo of the #48 sweetgum looking up and to the south. Note the large breakout point in the mid upper canopy (red arrow).



Figure 24. Photo of the #56 Moraine locust looking to the south. Note the low branch extending over the parked cars.

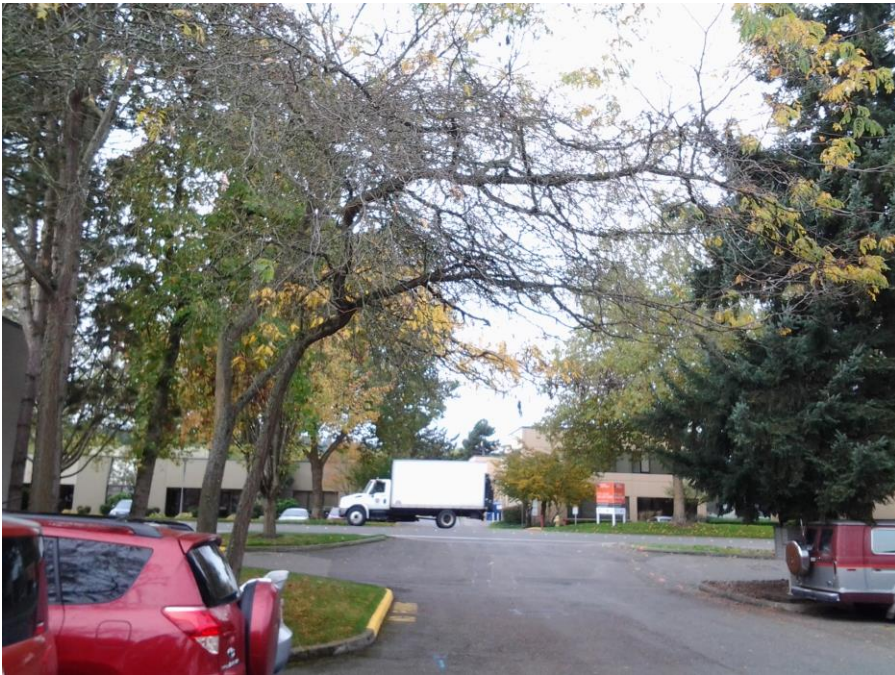


Figure 25. Photo of the #60 Moraine locust looking to the west. Note how low and how far over the driveway its canopy stands.

Figure 26. The matrix used to estimate the likelihood of a tree failure impacting a specific target.

Likelihood of Failure	Likelihood of Impacting Target			
	Very Low	Low	Medium	High
<i>Imminent</i>	Unlikely	Somewhat Likely	Likely	Very likely
<i>Probable</i>	Unlikely	Unlikely	Somewhat Likely	Likely
<i>Possible</i>	Unlikely	Unlikely	Unlikely	Somewhat Likely
<i>Improbable</i>	Unlikely	Unlikely	Unlikely	Unlikely

Figure 28. Risk rating matrix showing the level of risk as the combination of likelihood of a tree failing and impacting a specific target, and severity of the associated consequences.

Likelihood of Failure and Impact	Consequences			
	Negligible	Minor	Significant	Severe
<i>Very likely</i>	Low	Moderate	High	Extreme
<i>Likely</i>	Low	Moderate	High	High
<i>Somewhat likely</i>	Low	Low	Moderate	Moderate
<i>Unlikely</i>	Low	Low	Low	Low

PROPOSED ACTION AND BRIEF DESCRIPTION FOR TREES ON PROPERTY					
TREE TYPE	REMOVAL	IMPACTED (RETAINED) DUE TO NEW SIDEWALK AND UTILITIES	IMPACTED	RETAINED	TOTAL
Landmark (>30" dbh)	<u>Number of removed landmark</u> 0 trees	<u>Number of impacted landmark</u> 0 trees	<u>Number of impacted landmark</u> 0 trees	<u>Number of retained landmark</u> 0 trees	<u>Total number of landmark trees</u> 0 trees
	<u>% of Removed landmark trees of all trees</u> n/a	<u>% of impacted landmark trees of all trees</u> n/a	<u>% of impacted landmark trees of all trees</u> n/a	<u>% of retained landmark trees of all trees</u> n/a	<u>% of landmark trees of all trees</u> n/a
Significant not in buffer (6" - 30")	<u>Number of removed significant</u> 3 trees (#45, #46, #47)	<u>Number of impacted significant</u> 3 trees (#1, #3, #4)	<u>Number of impacted significant</u> 0	<u>Number of retained significant</u> 3 trees (#1, #3, #4)	<u>Number of significant trees</u> 3+3=6 trees
	<u>% of Removed significant trees of all significant trees</u> 3/11 trees = 27.3%	<u>% of impacted significant trees of all significant trees</u> 3/11 trees = 27.3%	<u>% of impacted significant trees of all significant trees</u> 0	<u>% of retained significant trees of all significant trees</u> 3/11 trees = 27.3%	<u>% of significant trees of all trees</u> 3/11 trees = 27.3%
Significant in buffer (6" - 30")	<u>Number of removed significant</u> 0	<u>Number of impacted significant</u> 0	<u>Number of impacted significant</u> 1 tree (#42)	<u>Number of retained significant</u> 5 trees (#10, #12, #21, #22, #42)	<u>Number of significant trees</u> 0+5 = 5 trees
	<u>% of Removed significant trees of all significant trees</u> 0	<u>% of impacted significant trees of all significant trees</u> 0	<u>% of impacted significant trees of all significant trees</u> 1/11= 9.1%	<u>% of retained significant trees of all significant trees</u> 5/11 =45.5%	<u>% of significant trees of all trees</u> 5/11 =45.5%
Totals	<u>Number of removed landmark + significant trees</u> 0+3 = 3 trees	<u>Number of landmark + significant</u> 0+3 =3 trees	<u>Number of landmark + significant</u> 0+1 =1 trees	<u>Number of landmark + significant</u> 0 + 8 = 8 trees	<u>Total number of all trees</u> 0+11 = 11 trees
	<u>% of Removed landmark + significant trees of all trees</u> 3/11 trees = 27.3%	<u>% of impacted landmark + significant trees of all trees</u> 3/11 = 27.3%	<u>% of impacted landmark + significant trees of all trees</u> 1/11= 9.1%	<u>% of retained landmark + significant trees of all trees</u> 8/11 = 72.7%	<u>Total % of significant trees of all trees</u> 27.3% + 45.5% = 72.8%
Replacement Trees	3 trees	n/a	n/a	n/a	

Figure 31. Summary table of retained and removed trees on the subject property. Note that while normally impacted trees are removed by default the four oaks on the west side and the fir at the SE corner will be retained and methodologies to limit impact to their CRA are given in the recommendation section of the report. The term ‘significant’ in this table refers to not only the sizes listed but also the condition of the trees.

PROPOSED ACTION AND BRIEF DESCRIPTION FOR TREES IN 150' BUFFER AND OFFSITE				
TREE TYPE	REMOVAL	IMPACTED	RETAINED	TOTAL
Landmark (>30" dbh)	<u>Number of removed landmark</u>	<u>Number of impacted landmark</u>	<u>Number of retained landmark</u>	<u>Total number of landmark trees</u>
	n/a	n/a	n/a	0 Trees
	<u>% of Removed landmark trees of all trees</u>	<u>% of impacted landmark trees of all trees</u>	<u>% of retained landmark trees of all trees</u>	<u>% of landmark trees of all trees</u>
	n/a	n/a	n/a	n/a
Significant (6" - 30")	<u>Number of removed significant</u>	<u>Number of impacted significant</u>	<u>Number of retained significant</u>	<u>Number of significant trees</u>
	0	0	18 trees	18 trees
	<u>% of Removed significant trees of all significant trees</u>	<u>% of impacted significant trees of all significant trees</u>	<u>% of retained significant trees of all significant trees</u>	<u>% of significant trees of all trees</u>
	0	0	18/18 =100%	18/18 =100%
Totals	<u>Number of removed landmark + significant trees</u>	<u>Number of landmark + significant</u>	<u>Number of landmark + significant</u>	<u>Total number of all trees</u>
	0	0	0 + 18 = 18 trees	0+18 =18 trees
	<u>% of Removed landmark + significant trees of all trees</u>	<u>% of impacted landmark + significant trees of all trees</u>	<u>% of retained landmark + significant trees of all trees</u>	-
	0	0	18/18 =100%	
Replacement Trees	n/a	n/a	n/a	

Figure 32. Summary table of retained significant trees in the buffer area and outside the subject property.